

Do I Like Blue Because of my Shampoo?

How Everyday Chemicals Affect our Health and Behavior

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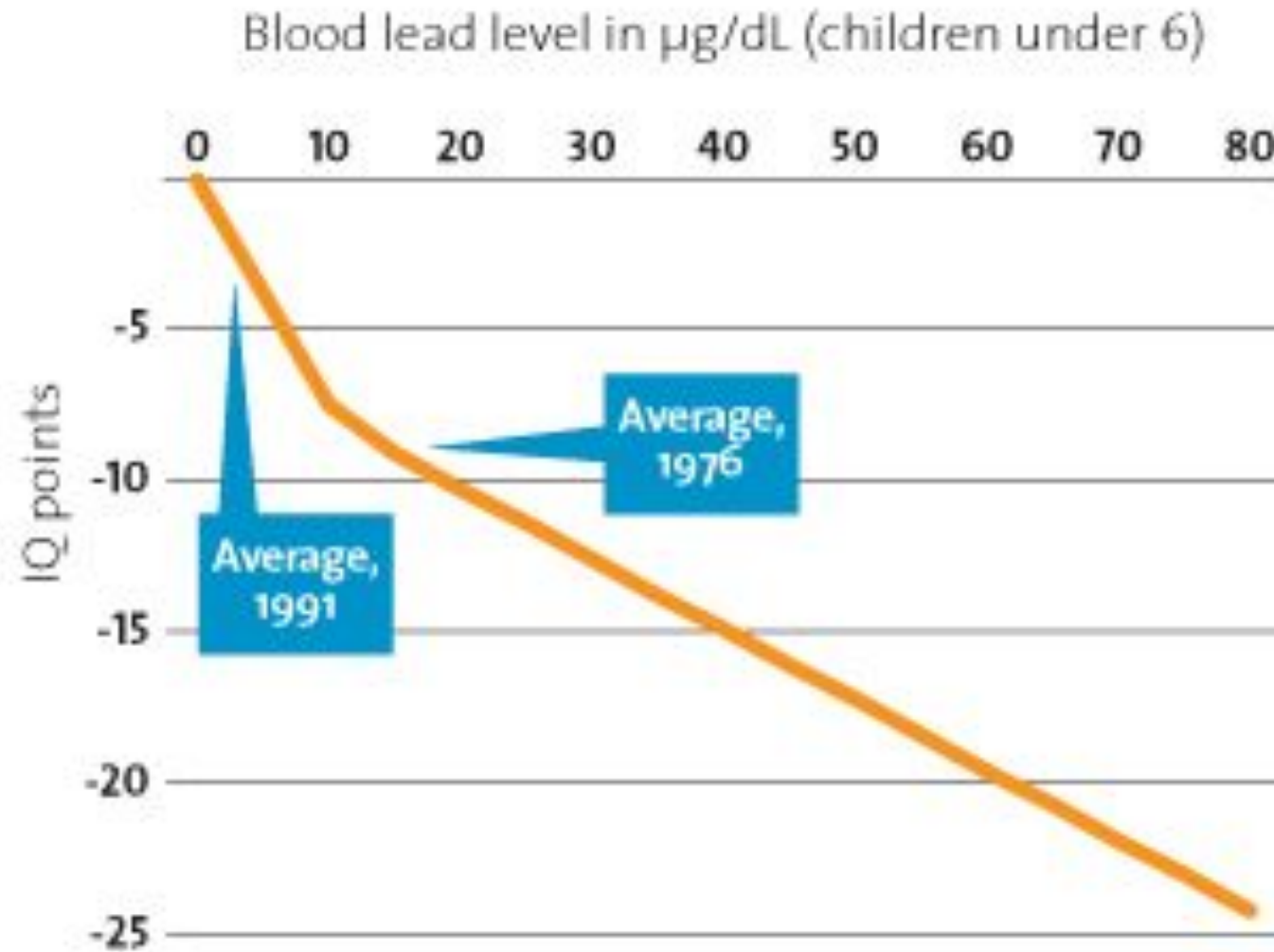
Objective

Convince you that chemicals not only are affecting your health, but who you are.

Outline

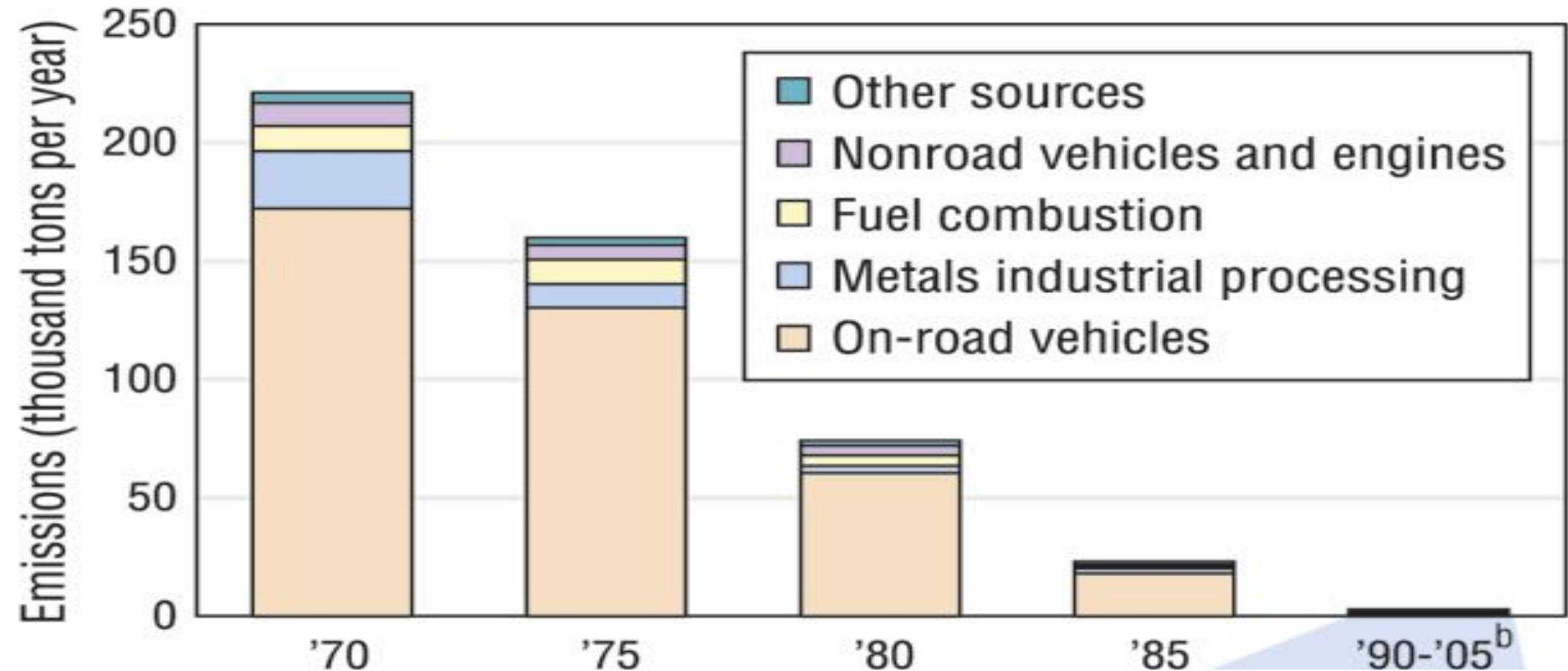
- A chemicals that is definitely affecting us
 - Lead
- Chemicals capable of affecting us with low exposure
 - PFAS
 - Bisphenol-A family
 - Chlorpyrifos
- Chemicals that may affect us with low exposure
- Recent regulatory changes
- How can we reduce our exposure to chemicals?

Lead – A Chemical that is Definitely Affecting Us

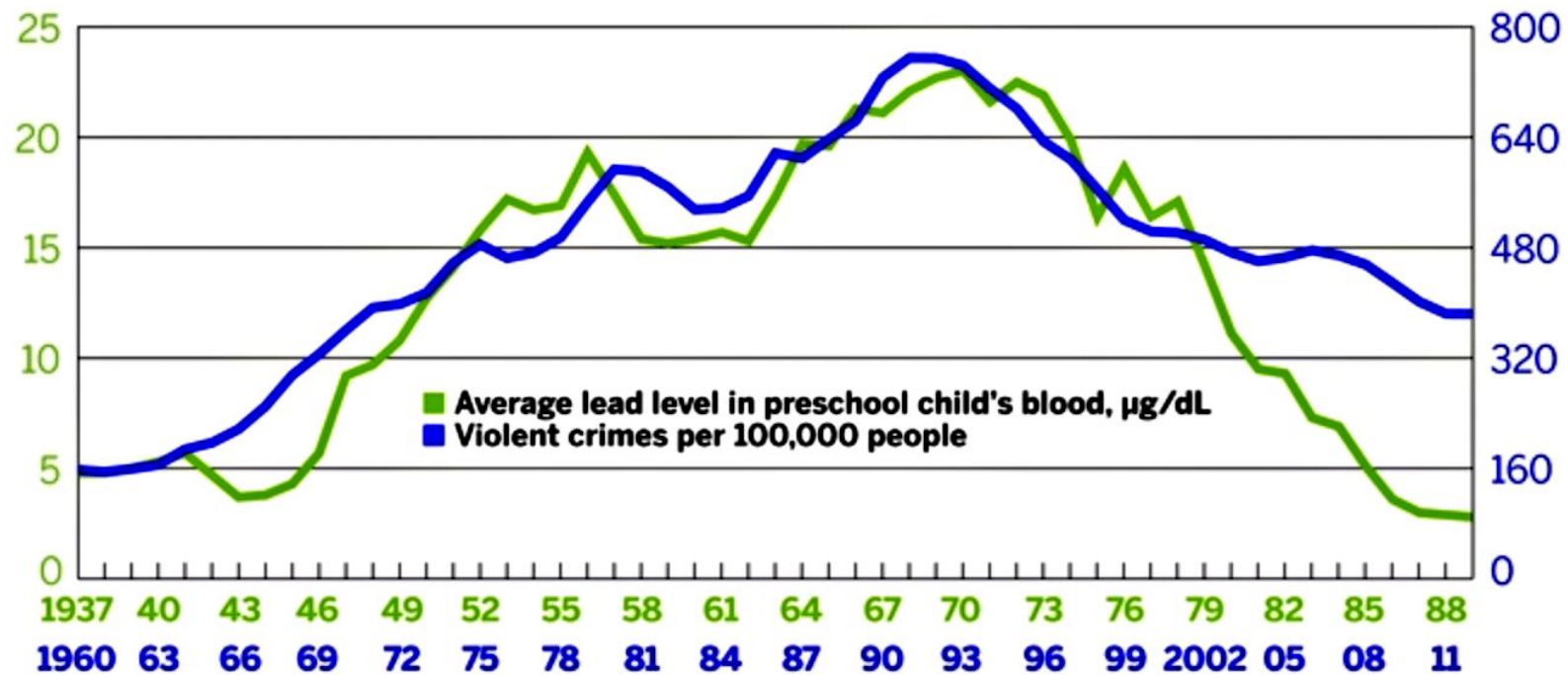


Six Point Increase

Lead Emissions in USA



Source: EPA



A timeline of lead reduction

1970

CDC sets acceptable blood-lead level of **40 µg/dL**

1973

EPA mandates a phaseout of leaded gasoline

1978

CPSC bans residential lead paint

1991

CDC sets acceptable blood-lead level of **10 µg/dL**

1996

EPA eliminates lead from all U.S. motor fuel

2012

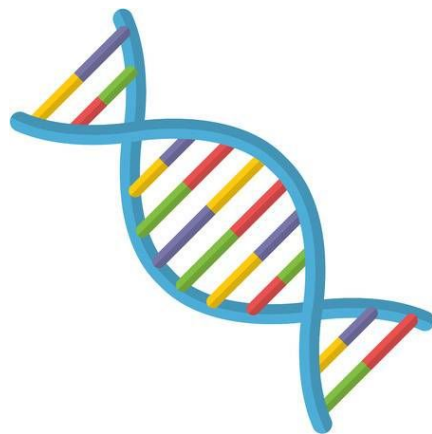
CDC describes blood-lead level of **>5 µg/dL** as elevated

GETTING THE LEAD OUT

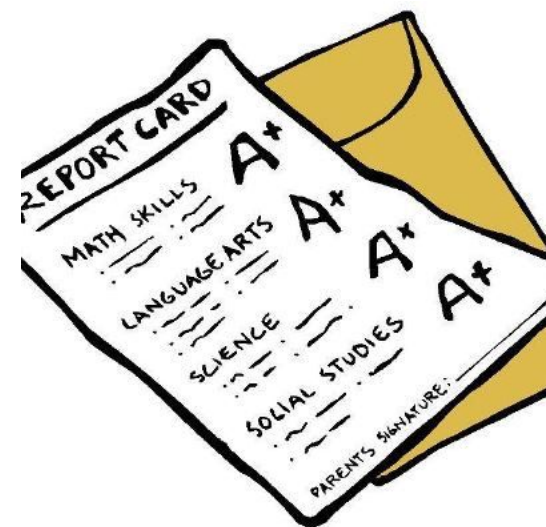
Economists hypothesize that regulation of leaded gasoline and lead paint in the 1970s caused crime rates to drop in the U.S. about 20 years later. CPSC = Consumer Product Safety Commission. SOURCES: Rick Nevin, FBI Uniform Crime Reporting Statistics



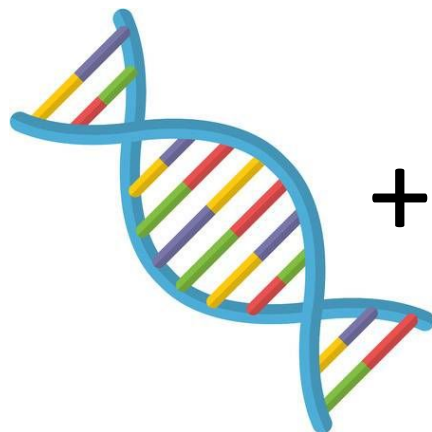
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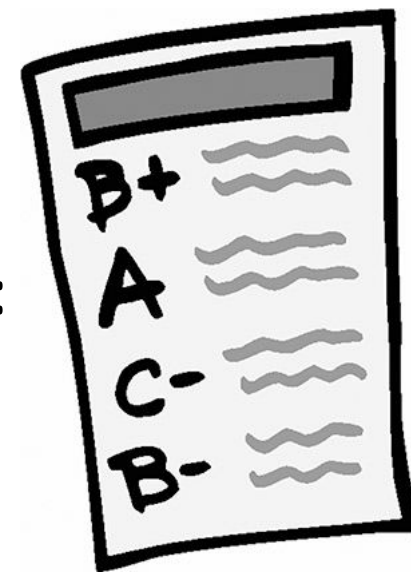
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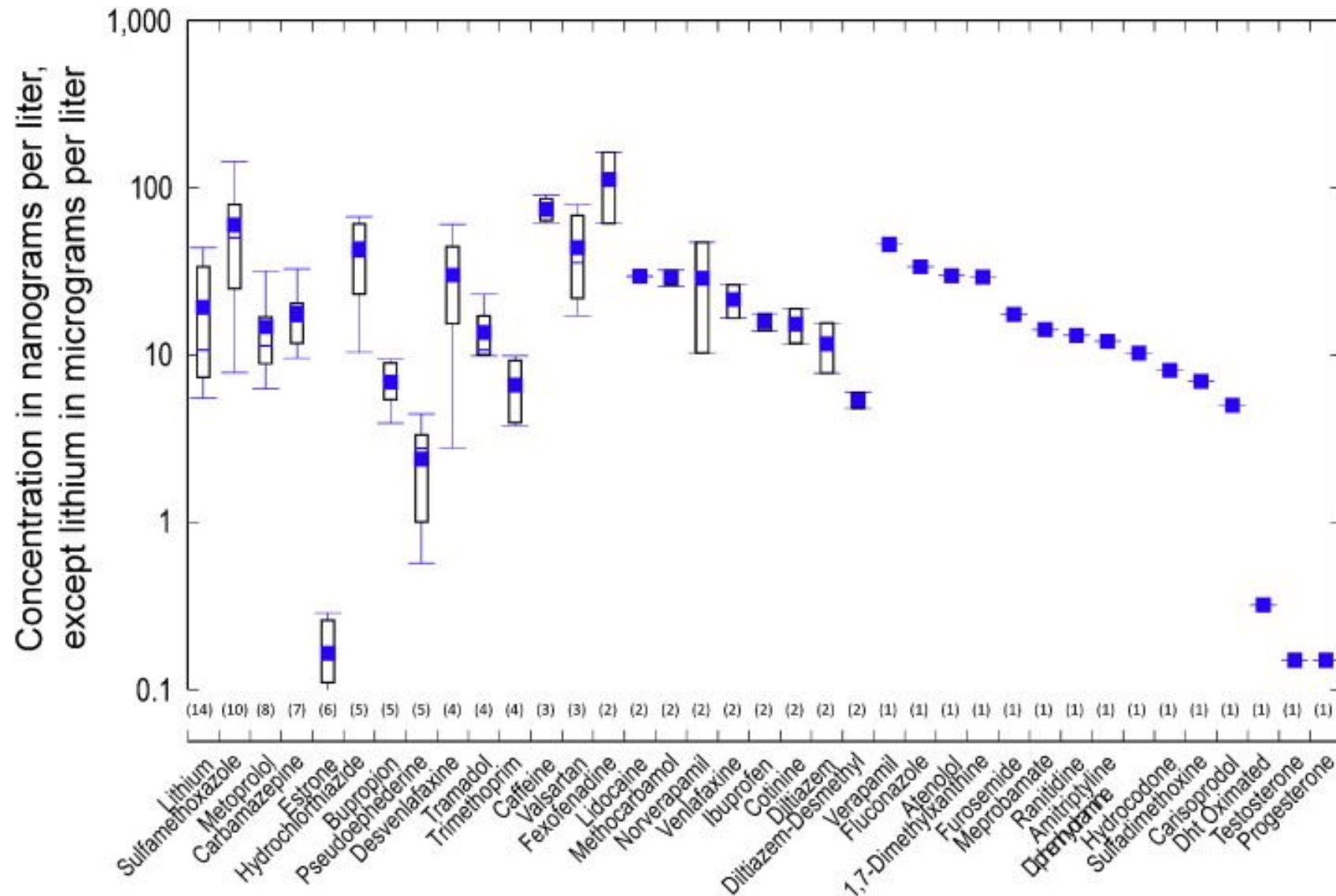
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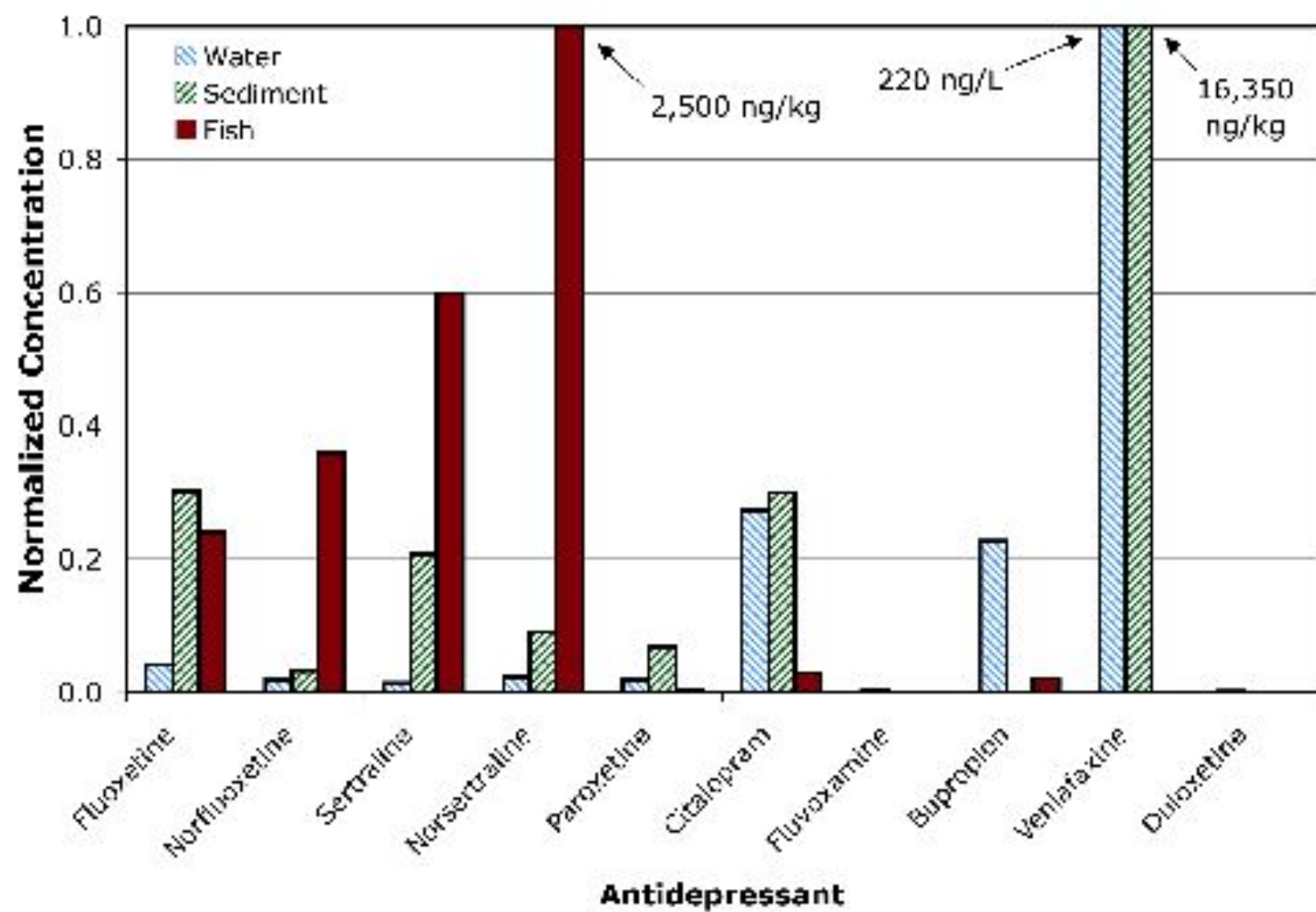
Other Chemicals that we Know Chemicals Affect our Behavior

- Pharmaceuticals (antidepressants, dopamine agonists for movement disorders) Illicit drugs (Methamphetamine, Cocaine, LSD, etc.)
- Hormones such as estrogens
- Caffeine

Pharmaceuticals in Drinking Water



Source: Furlong et al., 2016. *Sci. Tot. Environ.*



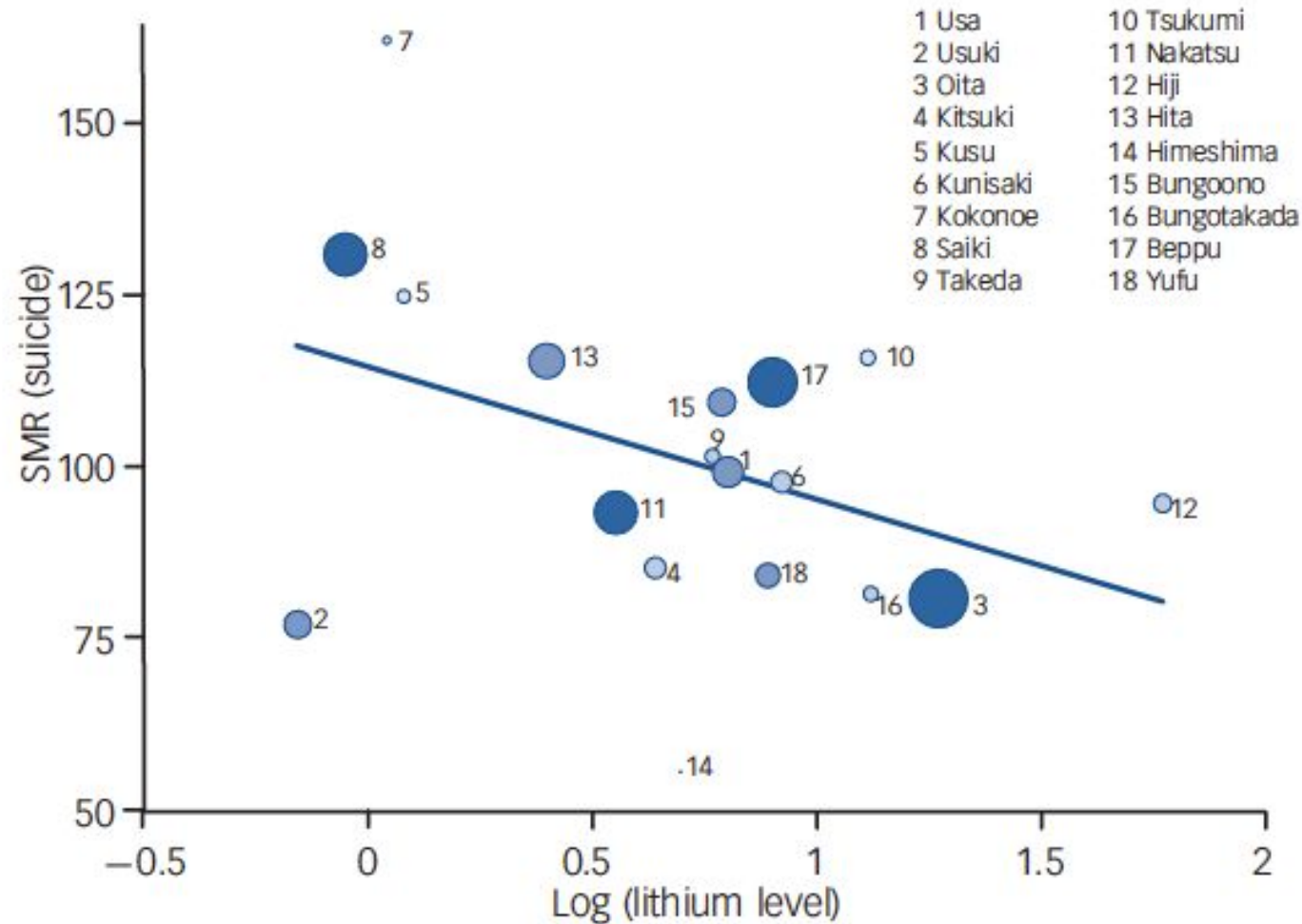
Illicit Drugs in Tap Water

Non-controlled and illicit drugs in tap water from cities of other countries (n = 26). Sum 95th percentiles. All values are expressed in ng L⁻¹.

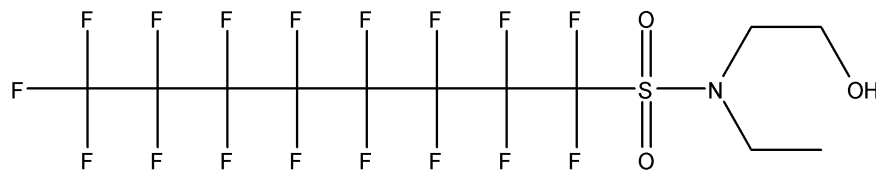
Name	No. >LOQ ^a	%Freq.	Mean			
			Global ^c	Europe	Japan	Lat.Am.
<i>Non-controlled</i>						
Caffeine	21	81	19	7.0	33	38
Nicotina	23	88	18	5.9	7.0	40
Cotinine	14	54	2.2	0.4	4.5	4.0
<i>Cocainics</i>						
Cocaine	12	46	0.3	0.1	<LOQ	0.6
Cocaethylene	3	11	–	<LOQ	–	<LOQ
Benzoyllecgonine	9	35	1.8	0.2	–	4.5
<i>Opiates</i>						
Methadone	5	19	0.1	0.1	–	0.2
EDDP	15	58	0.3	0.4	0.1	0.4
Fentanyl	0	0	–	–	–	–
<i>Amphetamines</i>						
AMP	0	0	–	–	–	–
MDA	4	15	<LOQ	–	–	<LOQ
METH	1	4	<LOQ	–	–	<LOQ
MDMA (ecstasy)	4	15	<LOQ	–	–	<LOQ
MDEA	2	8	<LOQ	–	–	<LOQ

Source: Boleda et al. 2011. *Chemosphere*.

Lithium can Decrease Violence and Suicide



Chemicals That May be Affecting us at Low Doses - Perfluoroalkyl Compounds

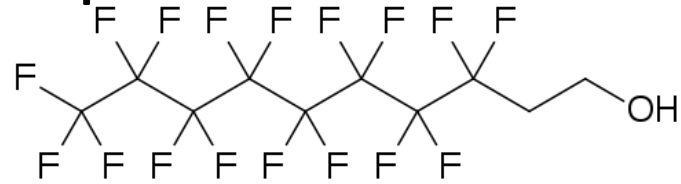


- Surfactants
- Lubricants
- Coatings
- Fire-Fighting Foams
- Adhesives
- Stain Repellents
- Insecticides



Global Production >10,000 tons/year

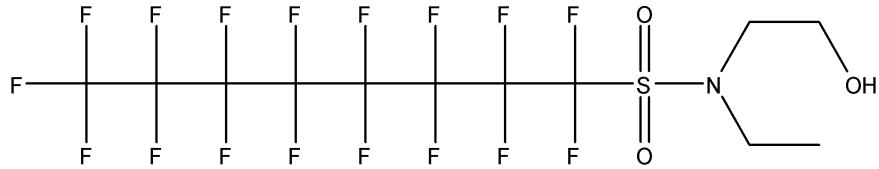
Most common repellents:



8:2 Fluorotelomer Alcohol

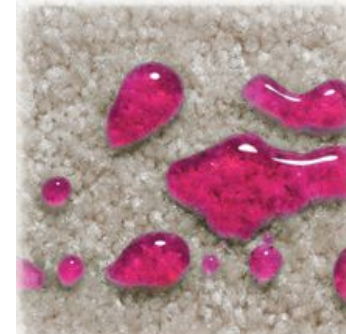
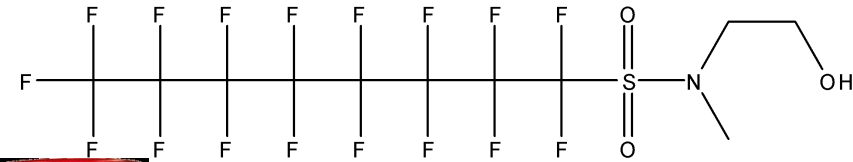
N-EtFOSE

N-ethyl perfluorooctane sulfonamido ethanol



N-MeFOSE

N-methyl perfluorooctane sulfonamido ethanol



PFAS Human Health Effects

- Kidney cancer
- Increased time to pregnancy
- Low birth weight
- Pregnancy-induced hypertension
- Thyroid disease
- Later puberty onset
- High LDL Cholesterol and lipid metabolism
- ADHD

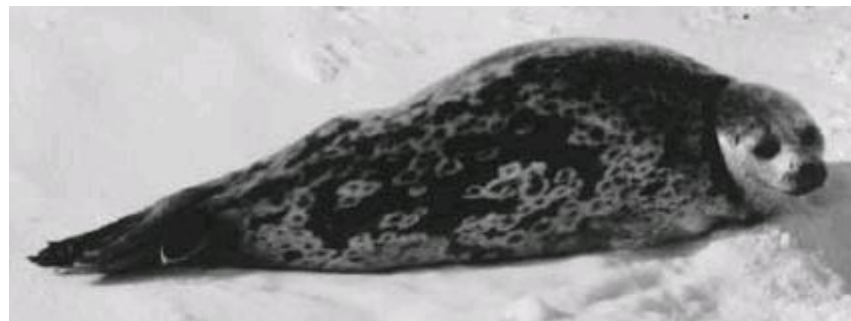
PFOS in Wildlife



4000 ppb in liver

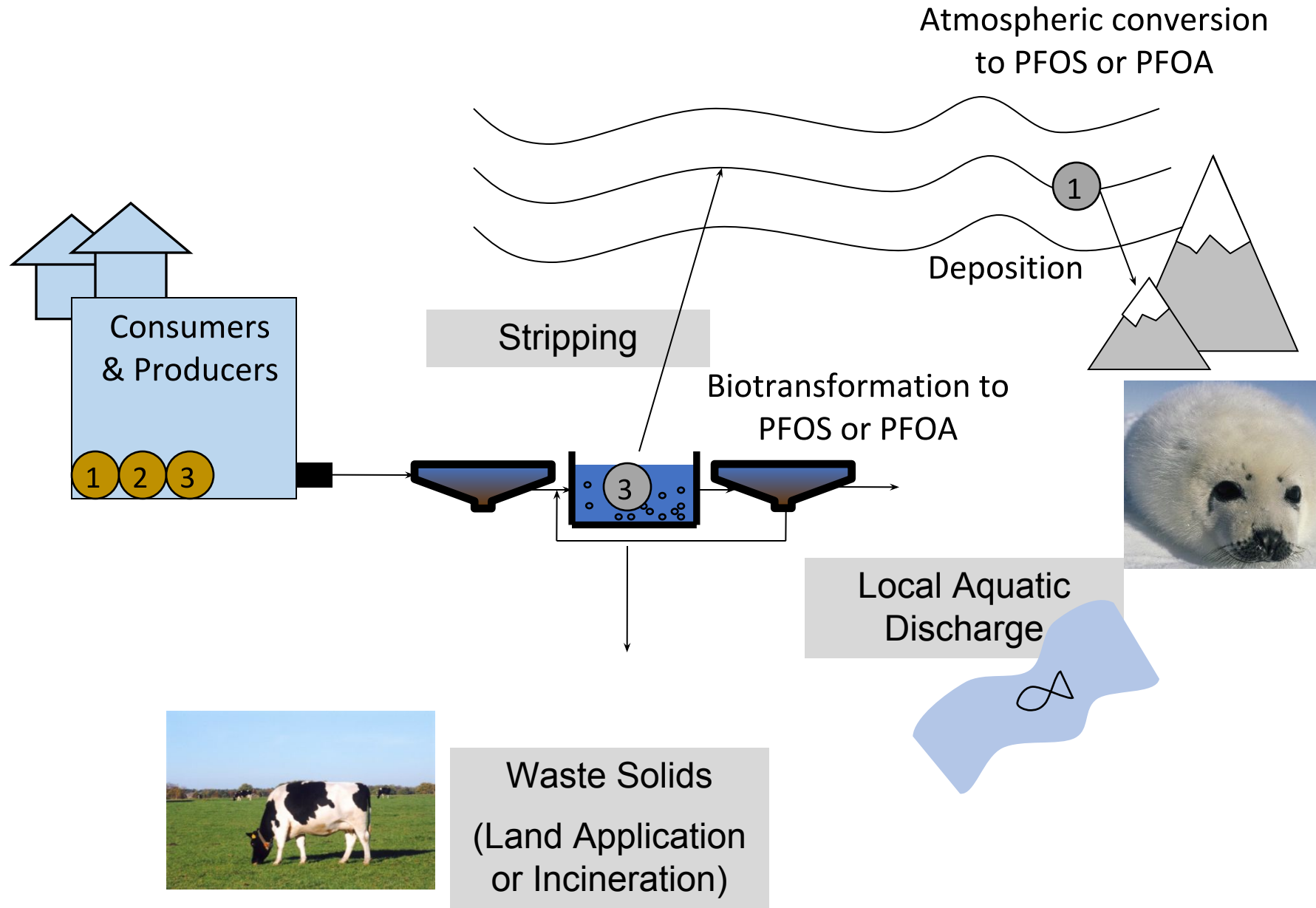


1 ppt in arctic snow

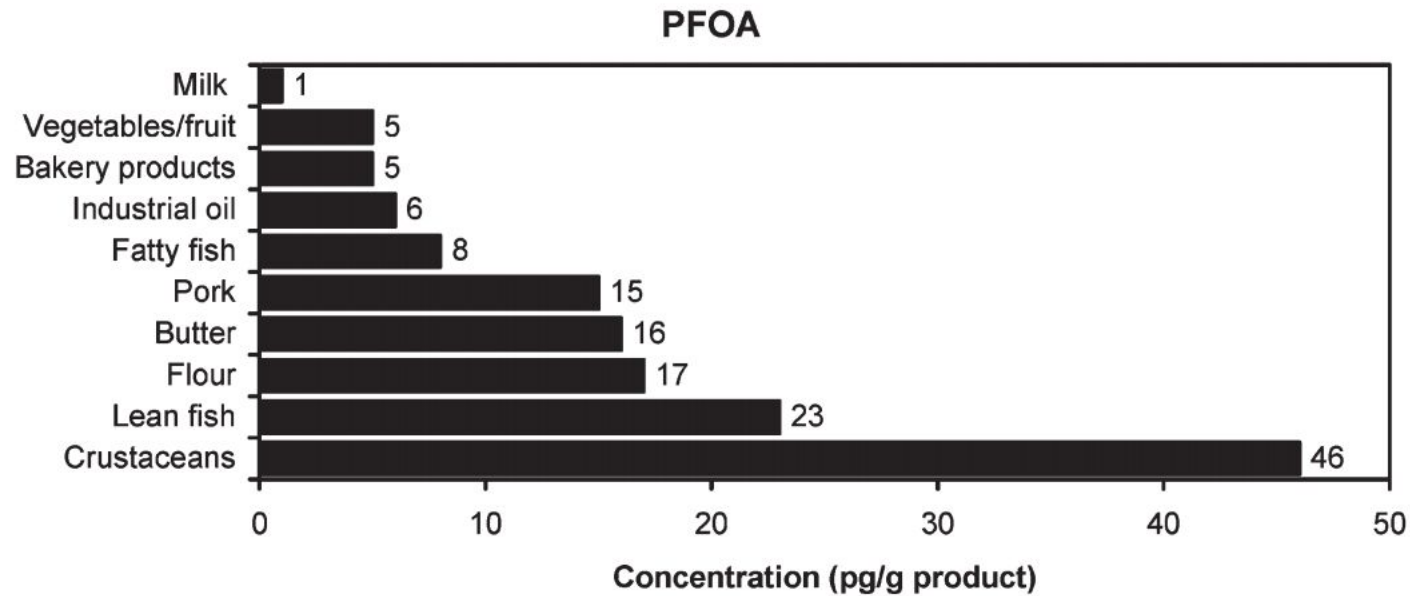


40 ppb in liver

Potential PFAS Fates

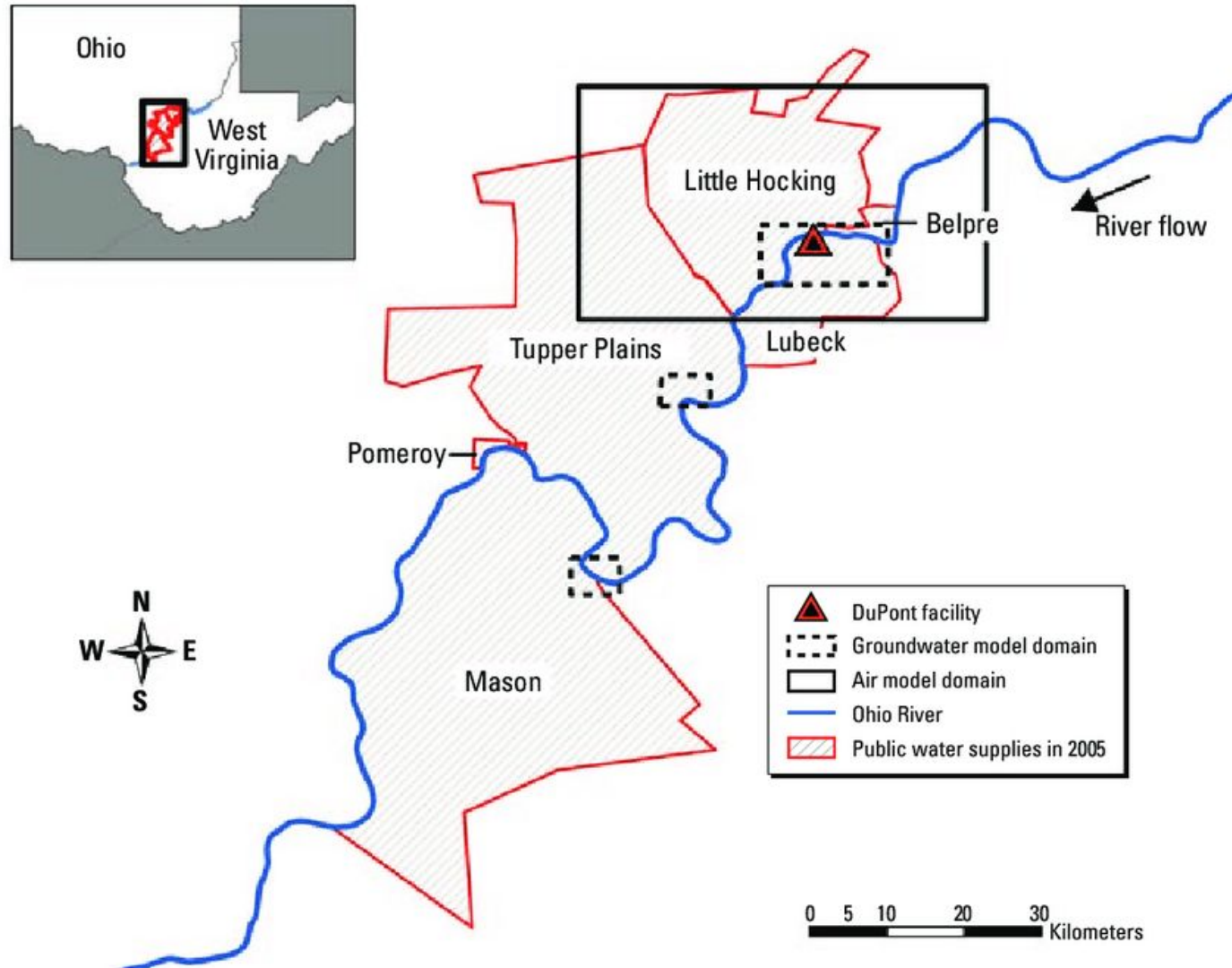


How are we exposed to PFASs?



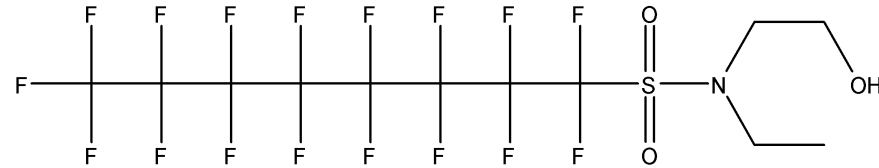
food category	PFOA		
	concentration (pg/g product)	intake (pg/kg bw/day)	percentage of individual daily intake
fatty fish	8	0.4	0.2
lean fish	23	2.2	0.9
crustaceans	46	0.7	0.3
butter	16	0.6	0.3
cheese	0	0	0
milk	0.5	3.9	1.6
eggs	0	0	0
pork	15	14.9	5.9
beef	0	0	0
chicken/poultry	0	0	0
bakery products	5	3.7	1.5
vegetables/fruit	5	47.4	18.9
flour	17	38.4	15.3
vegetable oil	0	0	0
industrial oil	6	0.7	0.3
drinking water	9*	137.9	55.0

How do we know?



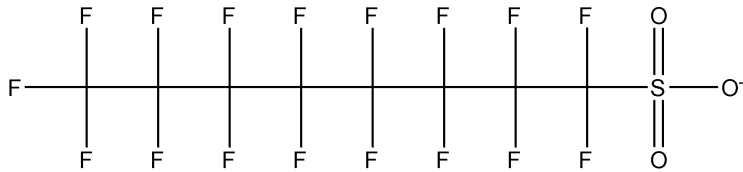
Perfluorinated Chemicals are Toxic

N-EtFOSE



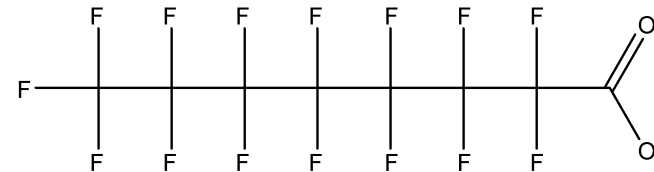
- rabbit weight loss or death > 5 kg/mg/day¹
- detected in air

PFOS



- Monkey death (100%) > 4.5 mg/kg day²
- Detected in human blood (~35 ppb)
- Detected in wildlife (up to 4000 ng/g in liver)

PFOA



- Likely Human Carcinogen³
- Detected in human blood (~5 ppb)
- Detected in wildlife (up to 500 ng/g)

¹ Case et al. 2001 ²3M 2001 ³US EPA 2005

Bisphenol A



BPA is an Endocrine Disruptor

BPA Linked to Obesity

BPA level Percentile	Weight >90 th		Adjusted Odds Ratio*
Percentile (µg/L)	No	Yes	(95% CI)
<50 th (0.98)	95 (79.17%)	25 (20.83%)	
50 th –75 th (0.98–4.13)	43 (70.49%)	18 (29.51%)	1.92 (0.79–4.66)
75 th –90 th (4.13–10.04)	24 (64.86%)	13 (35.41)	2.04 (0.77–5.41)
>90 th (10.04)	14 (58.33%)	10 (41.67%)	5.18 (1.68–15.91)

•Trend test: $p = 0.006$.

*Adjusted for those factors listed in Table 1 (age, gender, school, residence, paternal and maternal education and overweight, playing video games, unbalanced diet, eating junk food, vegetables or fruit, depression scores and sports/activities).

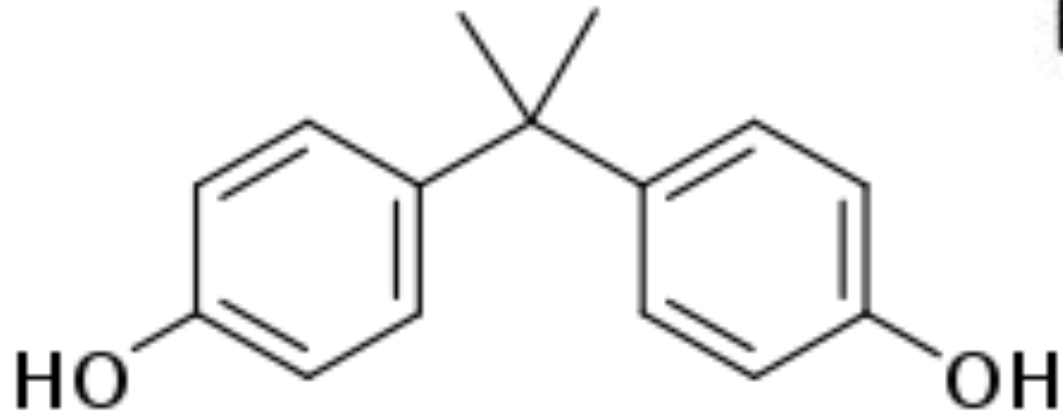
doi:10.1371/journal.pone.0065399.t003

BPA Affects Behavior of Offspring at Doses 10x less than Drinking Water Limit

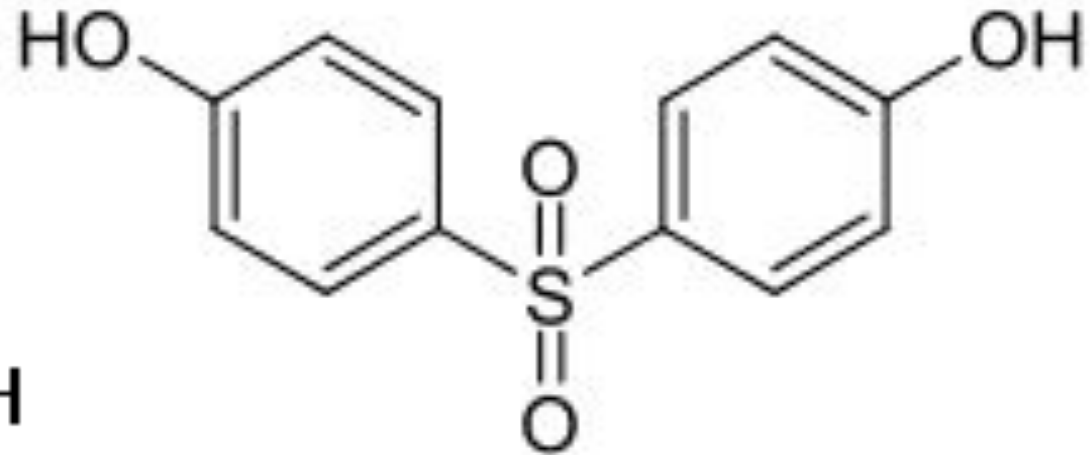
“...three-chamber test, in which a mouse is given the choice to interact with an unfamiliar [mouse]. The researchers found that mice whose mothers consumed both high and low doses of BPA were much more active and were more likely to interact with others than controls.”

Daley, 2018. *The Scientist*.

Replacement May be Just as Harmful



Bisphenol A



Bisphenol S

Endocrine Disruptors Can Make Birds More Attractive



... but they die earlier

Chlorpyrifos

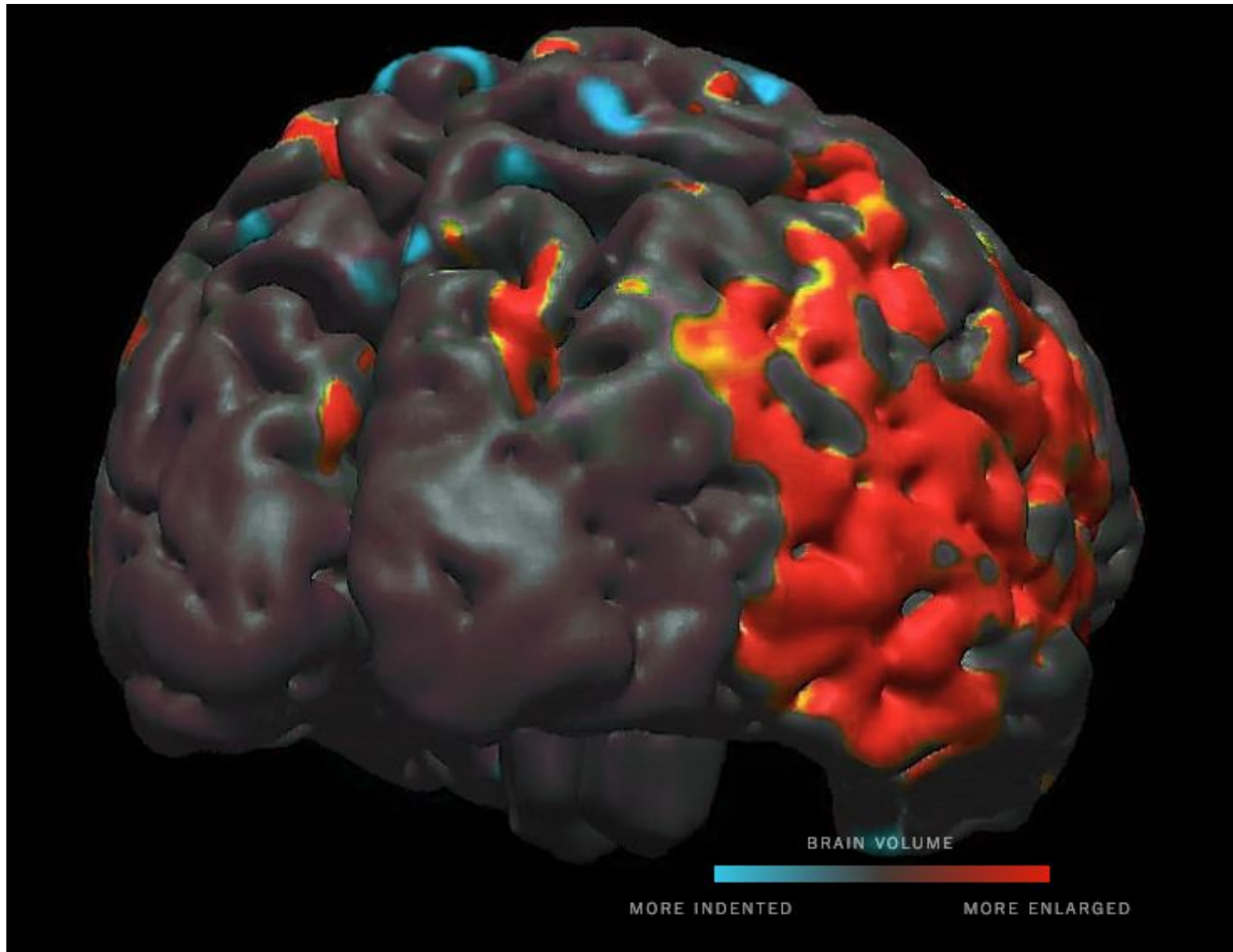
The New York Times

Court Orders E.P.A. to Ban Chlorpyrifos, Pesticide Tied to Children's Health Problems

~10 million pounds applied in the USA

Developmental Neurotoxin

- Lower IQ
- ADHD
- Impaired cognitive, behavior and motor problems



Recent Changes in Chemical Regulation

Pesticide Studies Won E.P.A.'s Trust, Until Trump's Team Scorned 'Secret Science'

Backed by agrochemical companies, the current administration and Congress are moving to curb the role of human health studies in regulation.

How can we reduce our exposure?



How can we reduce our exposure?

- Consume less things
- Use vinegar and soap instead of cleaning products
- Use products with safer chemicals
 - Environmental Working Group <https://www.ewg.org/skindeep/>
- Test paint and water for lead
- Buy organic produce

Beware

- Organic dry cleaning
- Substituting for products labelled, “safe”, “eco friendly”, or “green”



Essential Tips and Facts

See that long list of ingredients on the back of the bottle? Some probably aren't as safe as you'd hope.

- 1 Top tips for safer products
- 2 Frequently asked questions (FAQs)
- 3 Why Skin Deep®?
- 4 Myths on cosmetic safety
- 5 User's guide to Skin Deep®



LEARN MORE



Dental/oral | Lip Balm

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	Product ▼	Product Type(s)	Score
381.	 Maybelline Baby Lips Dr. Rescue Medicated Balm, Soothing Sorbet	Lip Balm	 Data: Limited
382.	 Maybelline Baby Lips Dr. Rescue Medicated Balm, Too Cool	Lip Balm	 Data: Limited
383.	 Maybelline Baby Lips Dr. Rescue Medicated Lip Balm	Lip Balm	 Data: Limited
384.	 Maybelline Baby Lips Electro Lip Balm, Berry Bomb	Lip Balm	 Data: Limited

Takeaway Messages

- Chemicals that we are exposed to every day are affecting our health and changing our fundamental character
- We should try to reduce our chemical exposures